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ODR, Ontologies, and Web 2.0

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Abstract: Online communities and institutions create new spaces for interaction, but also open new avenues for the emergence of grievances, claims, and disputes. Consequently, online dispute resolution (ODR) procedures are core to these new online worlds. But can ODR mechanisms provide sufficient levels of reputation, trust, and enforceability for it to become mainstream? This contribution introduces the new approaches to ODR and provides a description of the design and structure of Ontomedia, a web-based platform to facilitate online mediation in different domains.

Keywords: Semantic Web, Web-based services, Online Dispute Resolution (ODR), Relational justice
Categories: H.2, H.4

1 Introduction

Online Dispute Resolution (ODR) is an umbrella domain that covers a full range of processes (i.e. early neutral evaluation, negotiation, conciliation, mediation, and arbitration) to handle disputes online. ODR has often been equated to IT-supported or IT-enhanced Alternative Dispute Resolution (ADR) procedures and, certainly, in many ways ODR owes to traditional ADR many of its goals, principles, processes, and professional standards. Nevertheless, there is also a growing consensus in specialized literature to consider ODR more than just the delivery of ADR services through the Internet [Katsh, 01; Schultz, 02; Rule, 02; Kaufmann-Kohler, 04; Lodder, 10]. For some ten years now, more than a hundred projects, prototypes and commercial ventures altogether have shaped a distinctive domain where the technology component not only acquires a prominent role as the "fourth party" [Katsh, 01] but provides both disputants and third parties with unprecedented procedures and capacities. Yet, ODR has not moved along the track without shake:

the bursting of the dot-com bubble in 2001 led to many of the then emergent ODR providers to cease their commercial activity. By 2004, roughly 30 service providers (out of 115) were no longer operational [Conley Tyler, 04]. Since its inception in the late nineties, ODR has passed through different stages [Conley Tyler, 03, 04]:

- A "hobbyist" phase (1995-1996) where individual enthusiasts started working on ODR, often without formal backing.
- An "experimental" phase (1997-1998) where foundations and international bodies (i.e. the Hewlett Foundation and UNECE) funded academics and non-profit organisations to run pilot programs.
- An "entrepreneurial" phase where a number of for-profit organisations launched private ODR sites (1999-2001)
- An "institutional" phase (2001- onwards) piloted and adopted by a range of official bodies including courts and other dispute resolution providers.

Present ODR has become therefore a branch of dispute resolution in its own right and a mature domain with a number of consolidated services providing the default procedures for resolving disputes online [Rule, 08; Rabinovich, 08]. Especially when the judicial system is perceived too costly or inappropriate for a number of reasons (nature and/or value of the dispute, physical location of the parties, etc.) ODR has the potential to become an efficient default system. This is precisely the case for online communities such as e-Bay, whose dispute resolution services deal with roughly 40 million cases each year [Rule, 08]. Overall, recent research on ODR services has analyzed up to thirty five major service providers, most of them working on private schemes [Poblet, 10]. Even though they differ significantly on case figures, procedures, or business models, they all tend to deal with small value claims and procedural costs can be kept relatively low. However, and with some exceptions [Gabarró, 09] little is known on issues such as users' interaction with ODR services or adoption of state-of-the-art Web 2.0 standards. And yet, the emergence of the social Web may open new avenues for a new generation of ODR services.

2 ODR 2.0

The social Web breeds an ever-growing number of social networks that share all types of contents (documents, images, videos, music, etc.), knowledge, and expertise in a number of areas. Some recent figures may give an idea of the impressive growth rate of online social communities: (i) from a time spent perspective, member communities surpassed e-mail for the first time in February 2009 [Nielsen, 09]; (ii) previously, video audiences had already surpassed e-mail audiences in November 2007 (roughly 100 million users at the end of that year) [Nielsen, 09]; (iii) in countries such as Spain, United Kingdom and Italy, Internet users spend more than 20 percent of their online time in social networking [Nielsen, 10]. Additionally, research on targeted audiences reveal interesting facts, such as "new moms" (younger, one child), being much more likely to visit social networking sites and publish or own a blog than most other online users". For instance, new moms "are 85 percent more likely to spend time with Facebook compared to the average online consumer" [Nielsen, 09]. To Nielsen analysts, "becoming a mother is a dramatic inflection point and drives women to the Web in search of advice and a desire to connect with others in her shoes".

To what extent are these trends relevant for ODR? In 2006, Colin Rule welcomed Web 2.0 technologies and forecasted that "ODR will be one of the biggest beneficiaries of these new technologies, because they are squarely aimed at ODR's core functionality areas: communication, collaboration, and interactivity" [Rule, 06]. However, he also warned that "too many ODR providers rely on outdated platforms and technology because they are reluctant to make the investments in time and resources needed to bring their platforms up to Web 2.0 standards" [Hattotuwa, 08a]. Sanjana Hattotuwa went a step further anticipating unwanted consequences of ODR lagging behind the curve of Web 2.0 [Hattotuwa, 08b]:

"[T]he most obvious being that ODR itself may cease to exist. With the ubiquity of broadband wired and wireless connectivity, the ability to roll-out dispute resolution service online is possibly going to be seen as a normal service provision of ADR service providers, just like automated online tech support is now part and parcel of customer support mechanisms of many large software companies"

However, new horizons and opportunities for ODR have incredibly expanded over the last three years with the emergence of new web tools and services focusing on conflict prevention, crisis and conflict management, debate, or negotiation. Open source platforms such as Ushahidi,[1] FrontlineSMS,[2] or RapidSMS[3] are increasingly used to aggregate crowdsourced information and data—from SMS, tweets, etc.—to facilitate logistics coordination and response in emergencies, crises, and political conflicts (i.e. post-election violence). Usually, incoming data are geolocated and can be projected onto a crisis map (i.e. by using Google Maps and/or OpenStreetMap), and then tagged with different categories.

Even though different in nature and purpose, what these platforms have all in common are featured elements of state-of-the-art Web 2.0: open source software, free access, multiplatform facilities, real-time information streams, crowdsourced information and data, exportation of datasets, etc. Some of them—i.e. SwiftRiver in combination with Ushahidi[4]—already embrace Semantic Web open standards such as FOAF, iCal, Dublin Core, as well as open publishing endpoints such as Freebase to track and verify the accuracy of reports during a crisis, add structure to crisis data and make them shareable**.**

How ODR and its procedures may benefit from these new applications and utilities? Section 3 below offers some preliminary answers by presenting and describing our particular contribution to the field, the Ontomedia project.

3 The Ontomedia Project

People in need for help and assistance—as the new moms example shows— tend to look for help or advise in social communities and specialized web sites. This is where the Ontomedia platform aims at contributing. From the Ontomedia standpoint, both

1 http://www.ushahidi.com

2 http://www.frontlinesms.com

3 http://www.unicefinnovation.org/mobile-and-sms.php

4 http://swift.ushahidi.com/

Web 2.0 and Web 3.0 technologies can make significant advances into the ODR field, helping professionals to gather resources relevant to the mediation, conciliation or arbitration services they are providing, and helping users to share and contribute to harness the connective intelligence about ODR that can be found on the Web.

The main objective of Ontomedia is to allow users and ODR professionals to meet in a community-driven Web portal where contents are provided by users. Nevertheless, our focus is on mediation users—disputants and third parties—rather than on content itself. Thus, we expect the mediation users to create the contents and—by their use of natural language—the semantics that reflect how present their cases, how they interact with the mediators and the other parties and, ultimately, how they experience the mediation process.

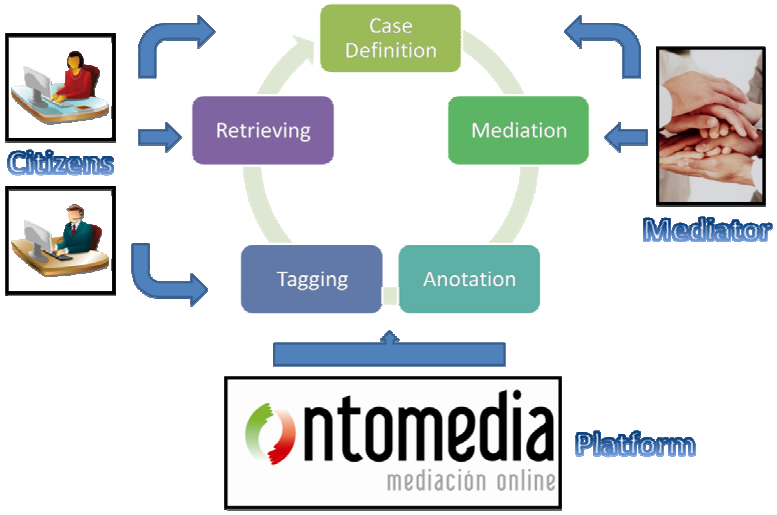

Figure 1: Ontomedia case lifecycle

The system will then map this incoming semantic content with light ontologies already stored in the system. On the one hand, Ontomedia works with the so-called Core Mediation Ontology (CMO) and sub-domain ontologies for each mediation sub-domain (e.g. the consumer domain, the family domain, the health domain, etc.) that model the main concepts and relationships in mediation. As we will explain later these sub-domains have been locally identified and well-described in the so-called Catalan White Book in Mediation[5] [Casanovas, 10]. This large empirical study has shown that mediation and ADR procedures are becoming a real alternative for litigation not only in the Common Law countries, but in some Civil Law European countries as well. Therefore, it comes without much surprise that 2% of the Catalan population (about 150.000 on 7,5 million) have been parties in a mediation process in 2008.

5 http://www.llibreblancmediacio.com

Yet, the Ontomedia ontologies do not aim at anticipating the needs of the users and impose formal semantic structures in advance. Rather, the aim is let the users define their needs and then elaborate semantic models that evolve as a by-product of the mediation processes.

4 Mediation as a Domain of Knowledge

A meta-analysis of the relational justice domain (the justice produced through cooperative behavior, agreement, negotiation, or dialogue among actors in conflict or post-conflict situations) reveals that there are at least thirty disciplinary areas contributing to the development of the domain [Casanovas, 08]. It therefore comes as no surprise if the mediation domain is populated with a full range of concepts, operational definitions, and models [Herrman, 06; Alexander, 08]. To quote a recent example, Alexander identifies up to six models of mediation practice: settlement mediation, facilitative mediation, transformative mediation, expert advisory mediation, wise counsel mediation, and tradition-based mediation [Alexander, 08]. In addition, as far as it provides a new procedural and communicational framework for interaction, decision-making, and emotion expression [Poblet, 07] online mediation may substantially transform any of those models.

4.1 Mediation as a Process

While bearing in mind the many possible ways in which mediation might be defined and modeled, therefore, we have opted for an approach that emphasizes the representation of the procedural aspects of mediation over the epistemological and theoretical ones. This is not meant to be an entirely agnostic approach, since the focus on procedures already implies epistemological and theoretical choices. Similarly, the emphasis on procedural knowledge does not entail neglecting conceptual knowledge on mediation. Rather, we intend MCO to be a shareable and reusable ontology so that we needed to restrain these ontological commitments to a minimum [Gruber, 95].

Coherently, we propose to define mediation as a voluntary, non-binding process in which a neutral third party, the mediator, assists the parties in reaching a settlement of the dispute. This definition is consistent with the one proposed by the Directive 2008/52/EC,[6] and flexible enough to allow any number of disputing parties, roles, and procedural stages of mediation. This same definition has been used in the White Book on Mediation in Catalonia [Casanovas, 10], and Noriega *et al.* [Noriega, 10] have developed a legal electronic institution (ELI) to capture in successive and iterative stages the argumentation process from negotiation to mediation and arbitration. In this perspective, ELI is orthogonal to Ontomedia [Casanovas 10b].

6 The Directive 2008/52/EC of the European Parliament and of the Council of 21 May 2008 on certain aspects of mediation in civil and commercial matters defines mediation in article 3(a) as "a structured process, however named or referred to, whereby two or more parties to a dispute attempt by themselves, on a voluntary basis, to reach an agreement on the settlement of their dispute with the assistance of a mediator. This process may be initiated by the parties or suggested or ordered by a court or prescribed by the law of a Member State".

Figure 2 below shows the whole structure, based on the Web Services model advanced by Hendler [Hendler, 09].

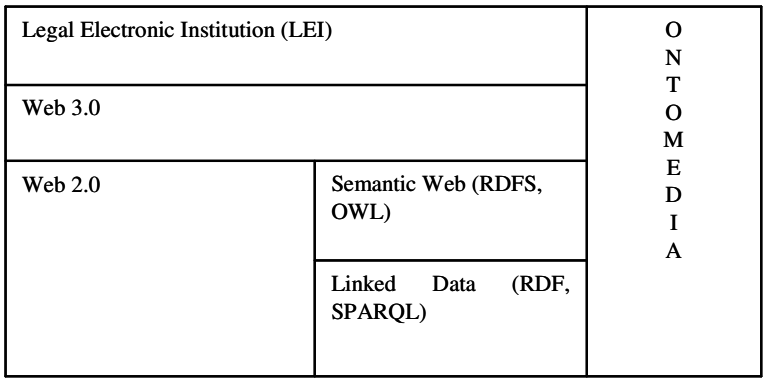

Figure 2: LEI and Ontomedia

4.2 Ontologies, mediation and ODR

To date, there is no working ontology dealing with the fundamental concepts of mediation as a process. Certainly, there is precedent work on ontology design within related domains, namely the e-commerce field [Tanma, 05], task collaboration [Ermolayev, 02], and negotiation agents [Anumba, 03]. There are also some ontologies that model different conflict events [Tanev, 08; Smart, 07] but in these cases the emphasis is put on terrorism and security issues rather than in conflict management.

Finally, there are a number of ongoing research projects that are currently developing ODR-related ontologies. The BEST project (BATNA Establishment using Semantic Web Technology) aims to provide disputing parties with information about their position in the negotiations before they seek professional assistance, and to assist them in the dispute or get information about the legal possibilities to claim compensations.[7] The ALIS Project (Automated Legal Intelligent System) combines game theory, computational logic, and legal reasoning to analyze the compliance of parties' requests in intellectual property disputes [Ceverini, 08]. The CEN Workshop on Standardization of Online Dispute Resolution Tools has elaborated a basic ontology of ODR processes.[8] While BEST and ALIS are producing in fact legal domain ontologies (covering damage disputes and intellectual property respectively), the CEN ontology is domain-independent and, thus, the closest precedent to our work.

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[7] BEST Project, http://www.best-project.nl/index.shtml

[8] CEN Workshop on Standardization of Online Dispute Resolution Tools, http://www.cen.eu/cenorm/businessdomains/businessdomains/isss/activity/ws_odr.asp

5 Mediation Core Ontology Development

The initial stages of the ONTOMEDIA project have run in parallel with the elaboration of the White Book on Mediation in Catalonia [Casanovas, 10]. The main purpose of the White Book is to provide Catalan lawmakers with in-depth research on the state-of-the-art mediation theories and practices as the basis for future legislation and policies. The White Book project has provided a unique opportunity to gather national and international leading experts and practitioners in a number of work sessions and workshops on concepts, methods, techniques and protocols of mediation. The expert knowledge and support offered by the participants and the outcomes of the White Book project have been integrated in the methodological development cycle of MCO. The methodological steps followed, already established and shared by several ontology development methodologies (such as METHONTOLOGY [Gómez Pérez, 03], On-To-Knowledge (OTK) [Sure, 03], HCOME [Kotis, 06] or UPON [Nicola, 05], etc.), take into account both the analysis of relevant textual materials towards ontology learning and the participation of experts during all the development process.

These methodological requirements influence the general steps taken: a preparatory step (establishment of requirements), a development step (knowledge acquisition, conceptualization and formalization), and an evaluation stage [Casellas, 08]. The preparatory and development steps are described below.

5.1 Ontology requirements

MCO serves as a general basis for the development of the mediation domain ontologies and sub-ontologies that will be used by the ONTOMEDIA platform. Therefore, it is directed at knowledge reuse, although it may also offer initial support towards knowledge acquisition and reasoning.

The knowledge acquisition stage is mainly based on the elicitation of expert knowledge. Nevertheless, existing upper ontologies (and legal core ontologies) are taken into account for design purposes. This knowledge acquisition process is guided by a list of questions establishing which knowledge ought to be included in the ontology and what type of answers ought the ontology to be able to give.

5.2 Knowledge acquisition

From the knowledge acquisition perspective, the White Book outputs (early drafts, workshop papers, literature reviews, etc.) were a first-hand input for ontology design in ONTOMEDIA. We analyzed these materials in consensus building sessions to identify a common conceptual framework broader enough to support different models and sub-domains of mediation. As a result, we elicited an initial taxonomy of concepts and relations, guided by the established competency questions (ORSD).

Purpose		Explicit expert knowledge in the mediation domain for knowledge reuse and for providing support towards knowledge acquisition and reasoning.
Methodological approach		An expert-based methodology based on the main steps provided and shared by several current ontology methodologies (METHONTOLOGY, OTK, HCOME or UPON): 1) preparatory step, 2) development step, and 3) evaluation step. The knowledge acquisition process is mainly based on knowledge elicitation from experts, although is supported by knowledge acquisition from texts and guidance from theoretical approaches to the analysis of the mediation domain.
Sources of knowledge	**Competency questions**	What types of mediation exist? What characterizes them? Are there separate acts or situations within a mediation process? Which documents or other information sources are produced or used during a mediation process or stage? Which participants can take part in a specific type of mediation process? Which restrictions on the mediation process are caused by the topic of the mediation? What are the limitations on agents regarding the roles they might take in a mediation process?
	Other sources	Expert elicitation (White Book of Mediation in Catalonia). Relevant regulations and legislation (e.g. Directive 2008/52/EC, EC Recommendation 98/257 & 2001/310).
Tool support		Statistic text analysis tools (JRef, Yoshikoder, AntConc, etc.)
Ontology editor		Protégé v. 3.4.
Reuse		No direct reuse of existing upper ontologies (modeling solutions from PROTON [Terziev, 05], LKIF-Core [Breuker, 07], CLO (DOLCE) [Gangemi, 05] have been taken into account).

Table 1: Mediation Core Ontology (MCO) Requirements Specification Document

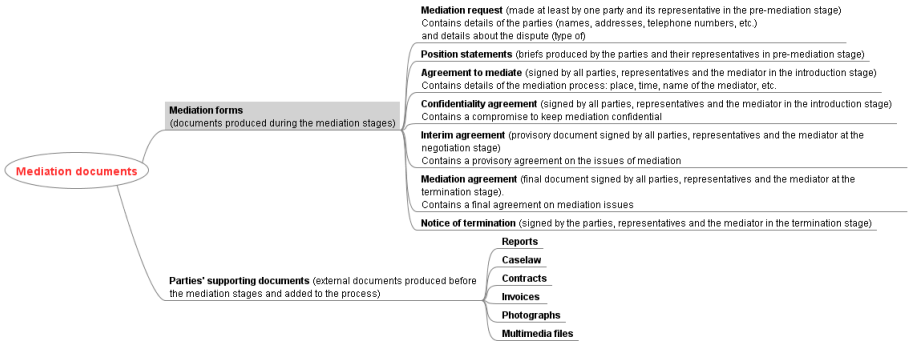

Figure 3: Taxonomy of mediation documents

A second source of acquisition of knowledge was drawn from ethnographic fieldwork, since one member of the team had been participating as a co-mediator in a multiparty mediation process. Participant observation also produced informal interviews with mediators conducted either individually or in group to elicit procedural knowledge used by domain experts in their practice. The translation of ethnographic findings into manageable knowledge leading to the design of ontologies relies on experience from related research projects [Casanovas, 09; Poblet, 08]. In this case, ethnographic research also loosely follows the guidelines of the EthnoModel, which are defined as a set of generic heuristics that "may be used both by investigators to conduct ethnographic studies of work and by designers interested in system design" (i.e. plans, procedures, and coordination) [Iqbal, 05].

We were able to complement these previous inputs with an analysis of mediation procedures as deployed by major mediation services (both online and off line service providers). Again, we have benefitted here from synergies from the White Book project, where we have developed a template to analyze which mediation stages and related mediation forms are most usual among major service providers (up to 35 so far), regardless of the mediation sub-domain involved [Poblet, 10].

Finally, relevant existing regulations within the European Union (*e.g.* Directive 2008/52/EC of the European Parliament and of the Council of 21 May 2008 on certain aspects of mediation in civil and commercial matters) were been taken into account as regards concept definitions and linguistic use of terms. For example, extracted relevant terms in the mediation domain from European regulations are:

mediation, parties, dispute, agreement, process, mediator, information, resolution, provider, etc.

6 Mediation Core Ontology (MCO)

The knowledge acquired in the previous phase (list of terms and conceptual schemas regarding knowledge required for the competency questions) from the experts has

been further formalized in OWL-DL.[9] The current version of the Mediation Core Ontology has 62 classes. The main objective of the formalization stage was to model formally the main acquired concepts related to the mediation domain and to try to establish the most important relations between them.

Figure 4: MediationRole in Mediation Core Ontology

Our approach has resulted in an initial taxonomic structure formed by the following concepts:

- `MediationAgent`: Includes all possible agents (actors) in the mediation domain.
- `MediationInformationSource`: All possible information sources, including the forms that are created within the mediation process or `MediationForm` (such as, `AgreementToMediate`, or `NoticeOfTermination`), and other sources of information that can support the claims of the disputants.
- `MediationTopic`: all topics that configure the different types of `MediationProcess`, for example, mediation regarding family issues, consumer related complaints, environmental issues, school or labour problems, etc. The mediation process, its agents and other related concepts may require different properties according to the topic or the particular problem underlying the process.
- `MediationProcess`: includes the different processes according to their topic. Thus, it includes as subclasses: `ConsumerMediation`, `SchoolMediation`, `LabourMediation`, etc.
- `MediationProcessStage`: identifiable stages of a mediation process.

[9] The ontology uses OWL DL constructs such as `owl:unionOf` and `owl:disjointWith`, together with cardinality values different from 0 or 1.

- `MediationSession`: identifiable situations taking part during the mediation process involving the different roles.
- `MediationRole`: all the possible roles that participants may assume in a mediation process (`Disputant`, `Mediator`, `ServiceProvider` are some of its subclasses).

Once this main hierarchy of concepts could be established, these concepts were specified and the main relations existing between them, elicited from experts, were also formalized. At the moment, 10 owl:objectProperty and 3 owl:dataTypeProperties have been included in the ontology.

More complex relations and concept definitions have also been specified to allow reasoning on the mediation domain, and facilitate its reuse and specification by the specific ontology for the OntoMedia platform. For example, the ontology includes the specification of the idea that a mediation process requires at least two disputants and one mediator.

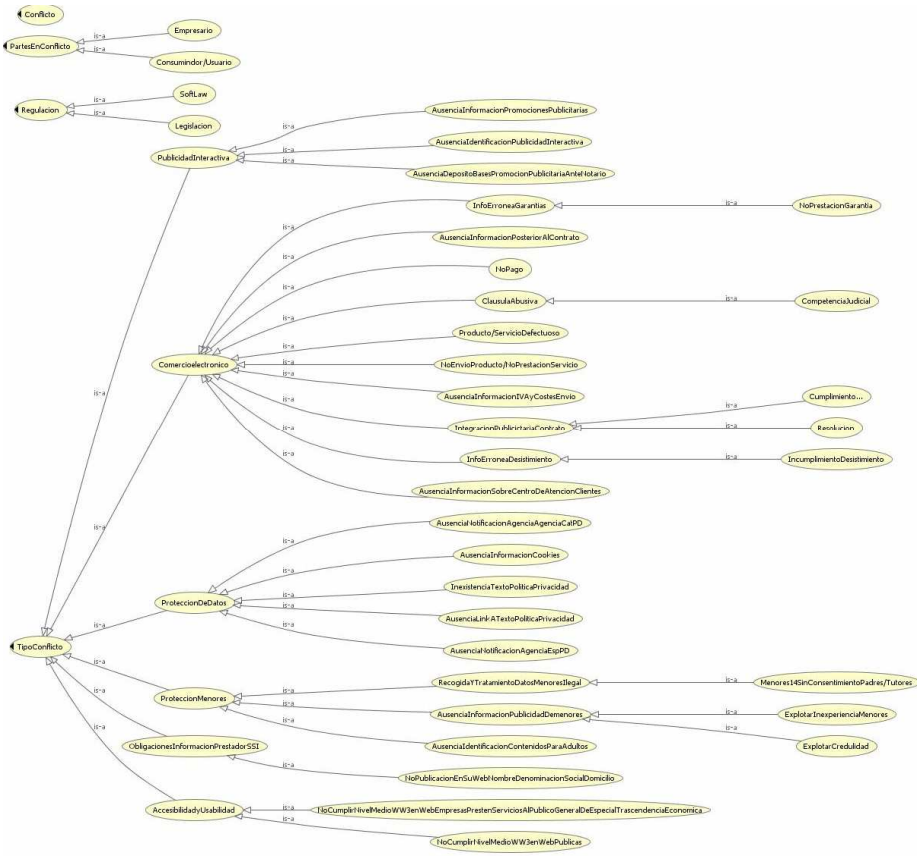

Figure 5: Ontology for mediation in the consumer domain

The Ontomedia platform will assist mediation users and professionals by providing assistance at different levels:

1. Information retrieval on previous cases. Users and mediators will be able to consult previous cases, duly anonymized to ensure privacy and compliance with current legislation. Retrieval will be enhanced by one or more ontologies.
2. Definition of a case. To control the mediation process, the Core Mediation Ontology (CMO) models the basic concepts and relationships in mediation and creates templates to guide users and mediators throughout the process.
3. Mediation. Ontomedia will have videoconferencing facilities including different tools to provide mediators with information on the mood of the users (analyzing their voice, their movements, and their reactions).
4. Annotation. The system will be able to annotate the contents of the multimedia objects, being those texts, video, audio objects. These annotations will be further used to categorized and increase the case corpus. The annotations will be automatically realized against a set of ontologies on mediation and about the specific sub-domains.
5. Tagging. Ontomedia needs its users to enhance the contents. Every piece of information is susceptible of being tagged, thus creating mediation folksonomies that can be later used also in the information retrieval stage. Users will be able to tag, comment and suggest, creating online communities around their cases and their problems.

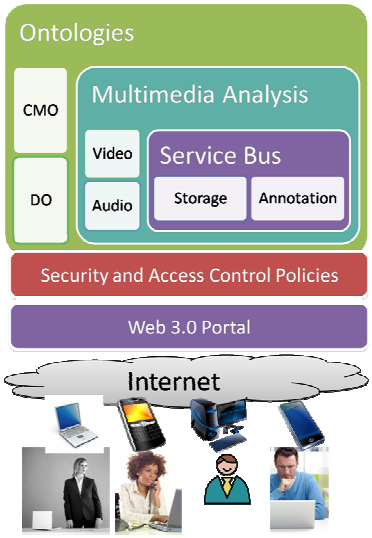

Figure 6: Ontomedia layered architecture

7 Web Oriented Architecture for an Enhanced Interaction

Mediation users and professionals alike can use any kind of devices to access the portal (computers, mobile phones), and in any format suitable to their purposes (text, speech, video, images, etc.). Users will therefore be able to participate in online mediation services as they do in a face-to-face basis, but with the advantages of distributed and even remote access.

In Ontomedia we also foresee the application of mediation services as tasks within a mediation process that will be formally described by means of both process ontologies and mediation ontologies. These services will be described, stored and made accessible through a service bus that will ensure end to end communication between consumers and providers, as well as a semantic execution engine that takes care of the execution of semantically enhanced mediation processes.

Ontologies will be used to annotate and analyze any type of content. The multimedia analysis aims at enhancing the information a mediator receives during a mediation session, capturing mood changes of the parties and any other psychological information inputs. All types of metadata will be automatically extracted and stored to be further used within the mediation process.

Ontomedia will also develop tools to invite users to exploit the advantages of sharing information and experiences with others. In this way, users will be able to tag and store content that consider useful or interesting to them, and to find similar cases. In doing so, they will be able to create social communities of people with common interests. And, related to those utilities, Ontomedia will provide a mashable suite of features that will allow users to locate similar cases to theirs. The semantic geographical location of those cases and its representation in a map is a trivial feature.

In contrast, what seems more interesting from a user perspective is the possibility to have tag clouds of concepts related to each case and a timeline of concepts against a case. The set of updated Web 3.0 features that will be enabled and accessible to users of the Ontomedia platform can be summarized here:

- Annotation of all types of contents. With this feature, a user can easily know if another case has some conceptual similarity with hers. Given a case, a useful visualization feature is the representation of those concepts more relevant in a case as a tag cloud. Just clicking in one concept or other in the tag cloud will show you a set of cases that also are related to that concept.
- Jointly with the annotation, some metadata extraction is automatically conducted, including geographical position of cases, time location and named entity recognition: (i) geo-location allows users to track similar cases, given the set of concepts related to the issues. The tag cloud will always show the concepts that are relevant to cases appearing in the map. Categorization and segmentation will be possible by means of several icons and with just a glimpse the user of the platform will have a tool for visualization and conceptual identification; (ii) with time location, users will have a timeline. Timelines can show the location of cases against time with respect a particular concept (the apparition of a case related to a concept in a particular time). With this feature, users will be able to see the evolution of the frequency of cases where a concept is concerned; (iii) where NER

(Named Entity Recognition) is concerned, the platform will be able to detect where well-known entities are mentioned.

In Ontomedia, well-known entities are concepts that transcend domain ontologies like person names, organizations, dates, places, figures and some others. The power behind this feature is that in doing so, we will be able to connect well-know entities with well-know facts as those defined with the LOD (Linked Open Data) principles [Berners-Lee, 06]. Where the name of a person is mentioned, if it exists, we will retrieve her FOAF[10] profile. Where a place is mentioned, we will extract the GeoName[11] information available, and so on. This information can be used within Ontomedia to add formal restrictions and reason over it. Each concept, each piece of information, each resource is susceptible to have a comment from any user. Users are encouraged to participate within the platform and to build it jointly with other users.

8 Conclusions

Despite the conceptual vagueness of their definitions, both Web 2.0 and Web 3.0 developments and technologies offer new forms to interact with the Web that are most relevant to ODR. To be sure, some of their critical features—openness, standardization, free access, connectedness, crowdsourcing effects, etc.—make it possible to enrich ODR services in a wider perspective. The Ontomedia project attempts to learn from these innovations so as to provide an easy-to-use web platform for both mediation domain experts and end-users. A distinctive aspect of Ontomedia, nevertheless, is the application of Semantic Web technologies to enhance online mediation processes. On the one hand, Ontomedia will use basic ontologies to annotate any kind of content (either textual or multimedia) to facilitate users to participate in the process and search any useful information on related cases. On the other, a semantic execution engine will take care of the execution of the semantically enhanced mediation processes.

Acknowledgements

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